

SEQUENCE LISTING

<110> HAKAMADA, YOSHIHIRO
OZAWA, TADAHIRO
KOBAYASHI, TOORU

<120> MUTATED ALKALINE CELLULASE

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<140> 10/510,716

<141> 2004-10-18

<150> PCT/JP03/05371

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<150> JP 2002-124474

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<170> PatentIn version 3.3

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Leu Val Leu Leu Leu Ser Leu Phe Pro Ala Ala Leu Ala Ala Glu Gly	
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Asn Thr Arg Glu Asp Asn Phe Lys His Leu Leu Gly Asn Asp Asn Val	
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Ser	Gln	Arg	Pro	Asp	Leu	Ala	Ala	Asp	Asn	Pro	Ile	Asp	Asp	His	His	
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Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Asn Leu Asp Pro Gly Pro	
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Asp His Val Trp Ala Pro Glu Glu Leu Ser Leu Ser Gly Glu Tyr Val	
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Ser Asp Gly Asn Phe Trp Ala Asn Ala Arg Leu Ser Ala Asn Gly Trp	
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Ser Asn Thr Arg Tyr Ala Leu Glu Asn Gly Val Ala Val Phe Ala Thr
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Glu Trp Gly Thr Ser Gln Ala Ser Gly Asp Gly Gly Pro Tyr Phe Asp
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Glu Ala Asp Val Trp Ile Glu Phe Leu Asn Glu Asn Asn Ile Ser Trp
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Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Asn Leu Asp Pro Gly Pro
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Asp His Val Trp Ala Pro Glu Glu Leu Ser Leu Ser Gly Glu Tyr Val
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Arg Ala Arg Ile Lys Gly Val Asn Tyr Glu Pro Ile Asp Arg Thr Lys
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Tyr Thr Lys Val Leu Trp Asp Phe Asn Asp Gly Thr Lys Gln Gly Phe
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Glu Asn Asn Thr Leu Lys Val Ser Gly Leu Asp Val Ser Asn Asp Val
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Ser Asp Gly Asn Phe Trp Ala Asn Ala Arg Leu Ser Ala Asn Gly Trp
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Ser Lys Ser Gly Trp Ala Asn Pro Glu Arg Ala Val Arg Val Asn Ala
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Glu Asp Phe Val Gln Gln Thr Asp Gly Lys Tyr Lys Ala Gly Leu Thr
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Glu Asp Asn Asn Met Asn Asn Ile Ile Leu Phe Val Gly Thr Asp Ala
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Ala Asp Val Ile Tyr Leu Asp Asn Ile Lys Val Ile Gly Thr Glu Val
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Val Phe Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly Glu Ser
 595 600 605

Gly Val Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser Asn Ala
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Ala Thr Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val Arg Gly
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Glu Asn Asp Tyr Val Ala Phe Asp Phe Tyr Leu Asp Pro Val Arg Ala
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Thr Glu Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro Thr Asn
675 680 685

Gly Tyr Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe Asp Glu
690 695 700

Leu Glu Glu Ala Asn Gln Val Asn Gly Leu Tyr His Tyr Glu Val Lys
705 710 715 720

Ile Asn Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu Leu Arg
725 730 735

Asn Met Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala Gly Arg
740 745 750

Val Phe Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr Glu Pro
755 760 765

Val Glu Pro Glu Pro Val Asp Pro Gly Glu Glu Thr Pro Pro Val Asp
770 775 780

Glu Lys Glu Ala Lys Lys Glu Gln Lys Glu Ala Glu Lys Glu Glu Lys
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Glu Ala Val Lys Glu Glu Lys Lys Glu Ala Lys Glu Glu Lys Lys Ala
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Asn Thr Arg Glu Asp Asn Phe Lys His Leu Leu Gly Asn Asp Asn Val
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Lys Arg Pro Ser Glu Ala Gly Ala Leu Gln Leu Gln Glu Val Asp Gly
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Gln Met Thr Leu Val Asp Gln His Gly Glu Lys Ile Gln Leu Arg Gly
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Met Ser Thr His Gly Leu Gln Trp Phe Pro Glu Ile Leu Asn Asp Asn
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Ala Tyr Lys Ala Leu Ala Asn Asp Trp Glu Ser Asn Met Ile Arg Leu
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Ala Met Tyr Val Gly Glu Asn Gly Tyr Ala Ser Asn Pro Glu Leu Ile
115 120 125

Lys Ser Arg Val Ile Lys Gly Ile Asp Leu Ala Ile Glu Asn Asp Met
130 135 140

Tyr Val Ile Val Asp Trp His Val His Ala Pro Gly Asp Pro Arg Asp
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Pro Val Tyr Ala Gly Ala Glu Asp Phe Phe Arg Asp Ile Ala Ala Leu
165 170 175

Tyr Pro Asn Asn Pro His Ile Ile Tyr Glu Leu Ala Asn Glu Pro Ser
180 185 190

Ser Asn Asn Asn Gly Gly Ala Gly Ile Pro Asn Asn Glu Glu Gly Trp
 195 200 205

Asn Ala Val Lys Glu Tyr Ala Asp Pro Ile Val Glu Met Leu Arg Asp
 210 215 220

Ser Gly Asn Ala Asp Asp Asn Ile Ile Ile Val Gly Ser Pro Asn Trp
 225 230 235 240

Ser Gln Arg Pro Asp Leu Ala Ala Asp Asn Pro Ile Asp Asp His His
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Thr Met Tyr Thr Val His Phe Tyr Thr Gly Ser His Ala Ala Ser Thr
 260 265 270

Glu Ser Tyr Pro Pro Glu Thr Pro Asn Ser Glu Arg Gly Asn Val Met
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Ser Asn Thr Arg Tyr Ala Leu Glu Asn Gly Val Ala Val Phe Ala Thr
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Glu Trp Gly Thr Ser Gln Ala Asn Gly Asp Gly Gly Pro Tyr Phe Asp
 305 310 315 320

Glu Ala Asp Val Trp Ile Glu Phe Leu Asn Glu Asn Asn Ile Ser Trp
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Ala Asn Trp Ser Leu Thr Asn Lys Asn Glu Val Ser Gly Ala Phe Thr
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Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Ser Leu Asp Pro Gly Pro
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Asp Gln Val Trp Val Pro Glu Glu Leu Ser Leu Ser Gly Glu Tyr Val
 370 375 380

Arg Ala Arg Ile Lys Gly Val Asn Tyr Glu Pro Ile Asp Arg Thr Lys
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Tyr Thr Lys Val Leu Trp Asp Phe Asn Asp Gly Thr Lys Gln Gly Phe
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Gly Val Asn Gly Asp Ser Pro Val Glu Asp Val Val Ile Glu Asn Glu
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Ala Gly Ala Leu Lys Leu Ser Gly Leu Asp Ala Ser Asn Asp Val Ser
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 485 490 495

Ser Ala Asn Trp Val Asn Pro Asn Arg Ala Ile Lys Val Glu Pro Thr
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Ser Ala Asp Ser Pro Ser Leu Glu Ala Ile Ala Met His Ala Glu Asn
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Val Ile Tyr Leu Asp Asn Ile Lys Val Ile Gly Thr Glu Val Glu Ile
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Pro Val Val His Asp Pro Lys Gly Glu Ala Val Leu Pro Ser Val Phe
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Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly Glu Ser Gly Val
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Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser Asn Ala Leu Ser
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Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp Asn Trp Ala Thr
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Asp Tyr Val Thr Phe Asp Phe Tyr Leu Asp Pro Val Arg Ala Thr Glu
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Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe Asp Glu Leu Glu
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Glu Pro Asn Gln Val Asn Gly Leu Tyr His Tyr Glu Val Lys Ile Asn
705 710 715 720

Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu Leu Arg Asn Met
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Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala Gly Arg Val Phe
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Lys Arg Pro Ser Glu Ala Gly Ala Leu Gln Leu Gln Glu Val Asp Gly
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Met Ser Thr His Gly Leu Gln Trp Phe Pro Glu Ile Leu Asn Asp Asn
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Ala Tyr Lys Ala Leu Ala Asn Asp Trp Glu Ser Asn Met Ile Arg Leu
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Ala Met Tyr Val Gly Glu Asn Gly Tyr Ala Ser Asn Pro Glu Leu Ile
 115 120 125

Lys Ser Arg Val Ile Lys Gly Ile Asp Leu Ala Ile Glu Asn Asp Met
 130 135 140

Tyr Val Ile Val Asp Trp His Val His Ala Pro Gly Asp Pro Arg Asp
 145 150 155 160

Pro Val Tyr Ala Gly Ala Glu Asp Phe Phe Arg Asp Ile Ala Ala Leu
 165 170 175

Tyr Pro Asn Asn Pro His Ile Ile Tyr Glu Leu Ala Asn Glu Pro Ser

180						185						190					
Ser	Asn	Asn	Asn	Gly	Gly	Ala	Gly	Ile	Pro	Asn	Asn	Glu	Glu	Gly	Trp		
		195					200					205					
Asn	Ala	Val	Lys	Glu	Tyr	Ala	Asp	Pro	Ile	Val	Glu	Met	Leu	Arg	Asp		
	210					215					220						
Ser	Gly	Asn	Ala	Asp	Asp	Asn	Ile	Ile	Ile	Val	Gly	Ser	Pro	Asn	Trp		
225					230					235					240		
Ser	Gln	Arg	Pro	Asp	Leu	Ala	Ala	Asp	Asn	Pro	Ile	Asp	Asp	His	His		
				245					250					255			
Thr	Met	Tyr	Thr	Val	His	Phe	Tyr	Thr	Gly	Ser	His	Ala	Ala	Ser	Thr		
			260					265						270			
Glu	Ser	Tyr	Pro	Pro	Glu	Thr	Pro	Asn	Ser	Glu	Arg	Gly	Asn	Val	Met		
		275					280					285					
Ser	Asn	Thr	Arg	Tyr	Ala	Leu	Glu	Asn	Gly	Val	Ala	Val	Phe	Ala	Thr		
	290					295					300						
Glu	Trp	Gly	Thr	Ser	Gln	Ala	Asn	Gly	Asp	Gly	Gly	Pro	Tyr	Phe	Asp		
305					310					315					320		
Glu	Ala	Asp	Val	Trp	Ile	Glu	Phe	Leu	Asn	Glu	Asn	Asn	Ile	Ser	Trp		
				325					330					335			
Ala	Asn	Trp	Ser	Leu	Thr	Asn	Lys	Asn	Glu	Val	Ser	Gly	Ala	Phe	Thr		
			340					345					350				
Pro	Phe	Glu	Leu	Gly	Lys	Ser	Asn	Ala	Thr	Ser	Leu	Asp	Pro	Gly	Pro		
		355					360					365					
Asp	Gln	Val	Trp	Val	Pro	Glu	Glu	Leu	Ser	Leu	Ser	Gly	Glu	Tyr	Val		
	370					375					380						

Arg Ala Arg Ile Lys Gly Val Asn Tyr Glu Pro Ile Asp Arg Thr Lys
 385 390 395 400

Tyr Thr Lys Val Leu Trp Asp Phe Asn Asp Gly Thr Lys Gln Gly Phe
 405 410 415

Gly Val Asn Gly Asp Ser Pro Val Glu Asp Val Val Ile Glu Asn Glu
 420 425 430

Ala Gly Ala Leu Lys Leu Ser Gly Leu Asp Ala Ser Asn Asp Val Ser
 435 440 445

Glu Gly Asn Tyr Trp Ala Asn Ala Arg Leu Ser Ala Asp Gly Trp Gly
 450 455 460

Lys Ser Val Asp Ile Leu Gly Ala Glu Lys Leu Thr Met Asp Val Ile
 465 470 475 480

Val Asp Glu Pro Thr Thr Val Ser Ile Ala Ala Ile Pro Gln Gly Pro
 485 490 495

Ser Ala Asn Trp Val Asn Pro Asn Arg Ala Ile Lys Val Glu Pro Thr
 500 505 510

Asn Phe Val Pro Leu Gly Asp Lys Phe Lys Ala Glu Leu Thr Ile Thr
 515 520 525

Ser Ala Asp Ser Pro Ser Leu Glu Ala Ile Ala Met His Ala Glu Asn
 530 535 540

Asn Asn Ile Asn Asn Ile Ile Leu Phe Val Gly Thr Glu Gly Ala Asp
 545 550 555 560

Val Ile Tyr Leu Asp Asn Ile Lys Val Ile Gly Thr Glu Val Glu Ile
 565 570 575

Pro Val Val His Asp Pro Lys Gly Glu Ala Val Leu Pro Ser Val Phe
 580 585 590

Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly Glu Ser Gly Val
 595 600 605

Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser Asn Ala Leu Ser
 610 615 620

Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp Asn Trp Ala Thr
 625 630 635

Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val Arg Gly Glu Asn
 645 650 655

Asp Tyr Val Thr Phe Asp Phe Tyr Leu Asp Pro Val Arg Ala Thr Glu
 660 665 670

Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro Thr Asn Gly Tyr
 675 680 685

Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe Asp Glu Leu Glu
 690 695 700

Glu Ala Asn Gln Val Asn Gly Leu Tyr His Tyr Glu Val Lys Ile Asn
 705 710 715 720

Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu Leu Arg Asn Met
 725 730 735

Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala Gly Arg Val Phe
 740 745 750

Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr Glu Pro Val Glu
 755 760 765

Pro Glu Pro Val Asp Pro Gly Glu Glu Thr Pro Pro Val Asp Glu Lys
 770 775 780

Glu Ala Lys Lys Glu Gln Lys Glu Ala Glu Lys Glu Glu Lys Glu Ala
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Val Lys Glu Glu Lys Lys Glu Ala Lys Glu Glu Lys Lys Ala Ile Lys
805 810 815

Asn Glu Ala Thr Lys Lys
820

<210> 9
<211> 810
<212> PRT
<213> Bacillus sp. strain KSM-N131

<400> 9

Met Met Leu Arg Lys Lys Thr Lys Gln Leu Gly Arg Pro Ala Gln Ala
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Glu Gly Asn Thr Arg Glu Asp Asn Phe Lys His Leu Leu Gly Asn Asp
20 25 30

Asn Val Lys Arg Pro Ser Glu Ala Gly Ala Leu Gln Leu Gln Glu Val
35 40 45

Asp Gly Gln Met Thr Leu Val Asp Gln His Gly Glu Lys Ile Gln Leu
50 55 60

Arg Gly Met Ser Thr His Gly Leu Gln Trp Phe Pro Glu Ile Leu Asn
65 70 75 80

Asp Asn Ala Tyr Lys Ala Leu Ser Asn Asp Trp Asp Ser Asn Met Ile
85 90 95

Arg Leu Ala Met Tyr Val Gly Glu Asn Gly His Ala Thr Asn Pro Glu
100 105 110

Leu Ile Lys Gln Arg Val Ile Asp Gly Ile Glu Leu Ala Ile Glu Asn
115 120 125

Asp Met Tyr Val Ile Val Asp Trp His Val His Ala Pro Gly Asp Pro
130 135 140

Arg Asp Pro Val Tyr Ala Gly Ala Lys Asp Phe Phe Arg Glu Ile Ala
 145 150 155 160

Ala Leu Tyr Pro Asn Asn Pro His Ile Ile Tyr Glu Leu Ala Asn Glu
 165 170 175

Pro Ser Ser Asn Asn Asn Gly Gly Ala Gly Ile Pro Asn Asn Glu Glu
 180 185 190

Gly Trp Lys Ala Val Lys Glu Tyr Ala Asp Pro Ile Val Gln Met Leu
 195 200 205

Arg Lys Ser Gly Asn Ala Asp Asp Asn Ile Ile Ile Val Gly Ser Pro
 210 215 220

Asn Trp Ser Gln Arg Pro Asp Leu Ala Ala Asp Asn Pro Ile Asp Asp
 225 230 235 240

His His Thr Met Tyr Thr Val His Phe Tyr Thr Gly Ser His Ala Ala
 245 250 255

Ser Thr Glu Ser Tyr Pro Pro Glu Thr Pro Asn Ser Glu Arg Gly Asn
 260 265 270

Val Met Ser Asn Thr Arg Tyr Ala Leu Glu Asn Gly Val Ala Val Phe
 275 280 285

Ala Thr Glu Trp Gly Thr Ser Gln Ala Asn Gly Asp Gly Gly Pro Tyr
 290 295 300

Phe Asp Glu Ala Asp Val Trp Ile Glu Phe Leu Asn Glu Asn Asn Ile
 305 310 315 320

Ser Trp Ala Asn Trp Ser Leu Thr Asn Lys Asn Glu Val Ser Gly Ala
 325 330 335

Phe Thr Pro Phe Glu Leu Gly Lys Ser Asn Ala Thr Ser Leu Asp Pro

340							345					350				
Gly	Pro	Asp	Gln	Val	Trp	Val	Pro	Glu	Glu	Leu	Ser	Leu	Ser	Gly	Glu	
		355					360					365				
Tyr	Val	Arg	Ala	Arg	Ile	Lys	Gly	Val	Asn	Tyr	Glu	Pro	Ile	Asp	Arg	
	370					375					380					
Thr	Lys	Tyr	Thr	Lys	Val	Leu	Trp	Asp	Phe	Asn	Asp	Gly	Thr	Lys	Gln	
385					390					395					400	
Gly	Phe	Gly	Val	Asn	Ser	Asp	Ser	Pro	Asn	Lys	Glu	Leu	Ile	Ala	Val	
				405					410					415		
Asp	Asn	Glu	Asn	Asn	Thr	Leu	Lys	Val	Ser	Gly	Leu	Asp	Val	Ser	Asn	
			420					425					430			
Asp	Val	Ser	Asp	Gly	Asn	Phe	Trp	Ala	Asn	Ala	Arg	Leu	Ser	Ala	Asn	
		435					440					445				
Gly	Trp	Gly	Lys	Ser	Val	Asp	Ile	Leu	Gly	Ala	Glu	Lys	Leu	Thr	Met	
	450					455					460					
Asp	Val	Ile	Val	Asp	Glu	Pro	Thr	Thr	Val	Ala	Ile	Ala	Ala	Ile	Pro	
465					470					475					480	
Gln	Ser	Ser	Lys	Ser	Gly	Trp	Ala	Asn	Pro	Glu	Arg	Ala	Val	Arg	Val	
				485					490					495		
Asn	Ala	Glu	Asp	Phe	Val	Gln	Gln	Thr	Asp	Gly	Lys	Tyr	Lys	Ala	Gly	
			500					505					510			
Leu	Thr	Ile	Thr	Gly	Glu	Asp	Ala	Pro	Ser	Leu	Glu	Ala	Ile	Ala	Met	
		515					520					525				
His	Ala	Glu	Asn	Tyr	Thr	Ile	Asn	Asn	Ile	Ile	Leu	Phe	Val	Gly	Thr	
	530					535					540					

Glu Gly Ala Asp Val Ile Tyr Leu Asp Thr Ile Lys Val Ile Gly Pro
 545 550 555 560

Glu Val Glu Ile Pro Val Val His Asp Pro Lys Gly Glu Ala Val Leu
 565 570 575

Pro Ser Val Phe Glu Asp Gly Thr Arg Gln Gly Trp Asp Trp Ala Gly
 580 585 590

Glu Ser Gly Val Lys Thr Ala Leu Thr Ile Glu Glu Ala Asn Gly Ser
 595 600 605

Asn Ala Leu Ser Trp Glu Phe Gly Tyr Pro Glu Val Lys Pro Ser Asp
 610 615 620

Asn Trp Ala Thr Ala Pro Arg Leu Asp Phe Trp Lys Ser Asp Leu Val
 625 630 635 640

Arg Gly Glu Asn Asp Tyr Val Thr Phe Asp Phe Tyr Leu Asp Pro Val
 645 650 655

Arg Ala Thr Glu Gly Ala Met Asn Ile Asn Leu Val Phe Gln Pro Pro
 660 665 670

Thr Asn Gly Tyr Trp Val Gln Ala Pro Lys Thr Tyr Thr Ile Asn Phe
 675 680 685

Asp Glu Leu Glu Glu Ala Asn Gln Val Asn Gly Leu Tyr His Tyr Glu
 690 695 700

Val Lys Ile Asn Val Arg Asp Ile Thr Asn Ile Gln Asp Asp Thr Leu
 705 710 715 720

Leu Arg Asn Met Met Ile Ile Phe Ala Asp Val Glu Ser Asp Phe Ala
 725 730 735

Gly Arg Val Phe Val Asp Asn Val Arg Phe Glu Gly Ala Ala Thr Thr
 740 745 750

Glu Pro Val Glu Pro Glu Pro Val Asp Pro Gly Glu Glu Thr Pro Pro
755 760 765

Val Asp Glu Lys Glu Ala Lys Lys Glu Gln Lys Glu Ala Glu Lys Glu
770 775 780

Glu Lys Glu Ala Val Lys Glu Glu Lys Lys Glu Ala Lys Glu Glu Lys
785 790 795 800

Lys Ala Ile Lys Asn Glu Ala Thr Lys Lys
805 810